

Remembrance of tussles past: paper wasps show surprisingly strong memory for previous encounters

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With brains less than a millionth the size of humans', paper wasps hardly seem like mental giants. But new research at the University of Michigan shows that these insects can remember individuals for at least a week, even after meeting and interacting with many other wasps in the meantime.

The finding suggests that the wasps' social interactions are based on memories of past encounters rather than on rote adherence to simple rules.



The research, by graduate student Michael Sheehan and assistant professor of ecology and evolutionary biology Elizabeth Tibbetts, is scheduled to be published in the September 23rd issue of the journal *Current Biology*.

What's impressive about the wasps' abilities is not simply that they can remember past events. Honeybees, after all, can remember where they've found nectar. "But those memories are pretty fleeting," Sheehan said. "There seems to be a limit to the number of things they can juggle in their head at one time."

Until now it was assumed that all social insects had similarly limited memories. But the new work shows that at least one species of paper wasp, *Polistes fuscatus*, has a strong, long-term memory and bases its behavior on what it remembers of previous social interactions with other wasps.

In earlier research, Tibbetts showed that these wasps recognize individuals by variations in their facial markings and that they behave more aggressively toward wasps with unfamiliar faces. If their memories are robust, the researchers reasoned, wasps should be less aggressive toward individuals they met even some time ago than toward new social partners.

To test the notion, Sheehan measured aggression between 50 wasp queens in four different encounters over eight days. On the first day, two wasps that never had met were placed in an observation chamber for a day and their initial interactions videotaped. Then the pair was separated, and each wasp was put in a communal cage with 10 other wasps. A week later, the pair met again, and again their behavior was videotaped.

When the researchers analyzed the videotapes, scoring the wasps' social interactions on a scale of zero (no aggression) to four (all-out grappling), it was clear that the wasps treated each other better during their second encounter than when they were strangers, suggesting they remembered each other.

"Instead of trying to bite each other and really have a rough-and-tumble encounter, they just sort of hung out next to each other when they met the second time," Sheehan said.

To make sure that any differences in aggression between the first and second encounters actually were based on memory, not just some general mellowing over time, the researchers introduced each wasp to a new

stranger on the day before and the day after the encounter with its old familiar social partner. As expected, the wasps were just as nasty to total strangers as they had been to each when they first met.

"The interesting aspect of this work is not just that the wasps have a good memory, but that it's social memory," Sheehan said. "It seems that their specific social history with particular individuals is something they're keeping track of and that it matters to their lives."

It matters because *Polistes fuscatus* females often share nests. Remembering who they've already settled their differences with makes for a more harmonious home life and keeps them from wasting energy on repeated aggressive encounters.

The findings also challenge assumptions about social cognition, Sheehan said. Scientists have thought the ability to form social memories and use them as the basis for complex relationships was a driving force behind the evolution of large brains. But if tiny-brained wasps have such ability, perhaps it doesn't demand as much brainpower as previously thought.

Source: University of Michigan

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